Borehole # 10-05-10

Log Event A

Borehole Information

Farm : A	**Tank :** A-105	**Site Number :** 299-E25-66
N-Coord : 41,339	**W-Coord :** 47,738	**TOC Elevation :** 687.65
Water Level, ft :	**Date Drilled :** 4/30/1962	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 125	

Borehole Notes:

This borehole was originally drilled in April 1962 and completed to a depth of 75 ft with 6-in.-diameter casing. In 1978, the borehole was deepened to a completed depth of 125 ft. An 8-in. casing was temporarily installed to a depth of 18 ft. Forty-five gal of grout was added to the annulus between the 6-in. and 8-in. casings and the 8-in. casing was then removed. An additional 9 gal of grout was added to the bottom of the borehole. There is no mention in the driller's log that the casing was perforated.

"As-built" drawings for the A Tank Farm indicate the original borehole was constructed with 6-in., schedule-30 pipe; however, this type of pipe was not identified in applicable engineering references. The casing thickness for the borehole is assumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. casing.

The top of the casing is the zero reference for the log. The casing lip is approximately even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 10/1996	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number :	1	**Log Run Date :**	11/14/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	123.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	63.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	11/15/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	64.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	0.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Borehole # 10-05-10

Log Event A

Log Run Number :	3	**Log Run Date :**	11/15/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	90.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	75.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged in three log runs. The total logging depth achieved by the SGLS was 123.5 ft.

Analysis Information

Analyst : S.D. Barry

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 03/12/1998

Analysis Notes :

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing (based on a 6-in., schedule-40 pipe) were applied to the entire logged interval during the analysis process.

Shape factor analysis was applied to the SGLS data and provided insights into the distribution of Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of the shape factor analysis results is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

The interval between 75 and 90 ft was relogged as an additional quality check and to demonstrate the repeatability of the radionuclide concentration measurements made by the SGLS. A comparison of the measured concentrations of the man-made and naturally occurring radionuclides using the data sets provided by the original and repeated logging runs is included with Appendix A. The measurements repeat within two

standard deviations (95-percent confidence level), indicating excellent repeatability of the measured gamma-ray spectral peak intensities used to calculate the radionuclide assays.

A time-sequence plot of the historical gross gamma log data from 1975 to 1993 is presented with the SGLS log plots. A plot of the observed decay of gamma activity at 59 ft is also included.

Results/Interpretations:

The only man-made radionuclide detected in this borehole was Cs-137. Cs-137 contamination was detected nearly continuously from the ground surface to 89.5 ft and just above the MDL at the bottom of the borehole.

The K-40 concentration values increase at a depth of about 10 ft. The K-40 log plot shows an interval of decreased concentrations between 20 and 26 ft. At 90 ft, the K-40 concentration values increase from about 13 to 16 pCi/g.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides. The Cs-137 contamination was measured above the 1 cps threshold from the ground surface to 51 ft, 60 to 71 ft, and 77 to 87 ft. Interpretations of the shape factor CsSF1 are available in the Tank Summary Data Report for tank A-105.

The interval from 75 to 90 ft was relogged as a quality assurance measure. The comparison between the original log run and the rerun log were generally within the 2 sigma uncertainty, indicating the excellent repeatability of the logging measurement.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank A-105.